

does not, during the August 1, 2001 telephone conference referred to above in the introductory paragraph. Reasons that it does not are explained in detail below. Despite the prior art not anticipating the claims, the identical rejections based on the same prior art were simply repeated in the March 13, 2001 Final Office Action. This duplication was made without any consideration given to the remarks presented in a January 10, 2001 Amendment, filed in response to the October 25, 2000 First Office Action. For these reasons, prosecution of the present application has not advanced to any substantive extent beyond the commencement of prosecution. Accordingly, Applicant respectfully believes that the finality of the March 13, 2001 Final Office Action is premature and requests that it be withdrawn for being premature.

REMARKS

Upon entry of this amendment claims 1-17 remain pending. In the March 13, 2001 Final Office Action, claims 1-11 and 13-17 and claims 9, 11, 15 and 17 were rejected under 35 U.S.C. 103(a) as being unpatentable over the Background section (pp. 1-2, Fig. 1) of the present application. Applicant respectfully requests reconsideration of the claims in view of the comments presented herein.

*Rejections Under 35 U.S.C. § 102(b) – Claims 1-11 and 13-17*

In the Office Action, the Examiner rejected claims 1-11 and 13-17 under 35 U.S.C. § 102(b) as being anticipated by the Background section (pp. 1-2, Fig. 1) of the present application. For the following reasons, Applicant respectfully believes that these rejections cannot be legitimately maintained.

To qualify for an anticipatory reference with regard to a specific claim, all elements and limitations of the claim must be disclosed in the reference. The Examiner asserts that all the claim elements and limitations of independent claims 1 and 13 are disclosed in the Background section (pp. 1-2, Fig. 1) of the present application. More specifically, the Examiner's basis for rejection of claims 1-11 and 13-17 is stated on page 2 as follows:

“Applicant's Application Background, pages 1-2 and Fig. 1, disclosees [sic] a process for manufacturing a trench field effect transistor comprising the steps of:  
etching a first trench in a substrate having a first conductivity type;  
lining the first trench with a layer of dielectric material;

substantially filling the trench with conductive material to form a gate electrode of the field effect transistor;  
implanting impurities of a second conductivity type into the substrate to form a body region having the second conductivity type over the substrate;  
implanting impurities of the first conductivity type inside the body region to form a source region adjacent to the first trench;  
etching a second trench through the source region and into the body region;  
and filling the second trench with conductive material for making contact with both the source and the body region.

Applicant respectfully disagrees. The trenches described in the Background section of the application are gate trenches. As described on page 1, lines 14-17, and as shown in Figure 1, a gate trench has a dielectric layer, which lines the trench, and a conductive material that fills the dielectric-lined trench. The dielectric layer prevents the conductive material from contacting the body region of the trench field effect transistor.

The "first trench" recited in both independent claims 1 and 13 is a gate trench, since it is used to form a gate electrode for the trench field effect transistor. The gate electrode is formed by the first three steps of the methods claimed in independent claims 1 and 13. Specifically, formation of the gate electrode in claim 1 comprises the first three steps of claim 1:

"forming a first trench extending into the substrate;  
lining the first trench with dielectric material; [and]  
substantially filling the first trench with conductive material to form a gate electrode of the field effect transistor...."

Claim 13 recites substantially similar steps to form a gate electrode.

By contrast, the "second trench" recited in both independent claims 1 and 13 is not a gate trench. Rather, it is a trench that accommodates a heavy body region of the transistor. Regarding claim 1 in particular, the heavy body region is formed in the last two steps:

"forming a second trench adjacent to said source region and extending into the body region below the source region; and  
filling the second trench with high conductivity material *for making contact to the body region.*"

(emphasis supplied).

Claim 13 recites substantially similar steps to form a trenched body region.

From the foregoing observations, it is clear that the gate trenches shown in the Background section of the present application are not trenches that accommodate a heavy body region. The highlighted portion of the excerpt from claim 1 above unequivocally illustrates the distinction between the two. The conductive material formed in the "second trench" makes contact to the body region but the conductive material in the gate trenches does not. Therefore, because the last two steps recited in claims 1 and 13 are not taught in the Background section of the invention, the Background section of the present invention does not anticipate either of claim 1 or claim 13. Accordingly, independent claims 1 and 13 are believed to be in a condition for allowance.

The Examiner has provided no reason why any of claims 2-11, which depend from independent claim 1, and claims 14-17, which depend from claim 13, are anticipated. It appears that the Examiner has only examined independent claims 1 and 13. Nevertheless, in light of the above arguments, which Applicant believes demonstrate the allowability of independent claims 1 and 13, these dependent claims should also be in a condition for allowance, as they depend from allowable base claims.

***Rejections Under 35 U.S.C. § 103(a) – Claims 9, 11, 15 and 17***

In the Office Action, the Examiner also rejected claims 9, 11, 15 and 17 under 35 U.S.C. § 103(a) as being unpatentable over the Background section (pp. 1-2, Fig. 1) of the present application. For the following reasons, Applicant respectfully disagrees.

As an initial matter, because claims 9, 11, 15 and 17 each depend from what Applicant believes to be allowable base claims (claims 1 and 13), it follows that claims 9, 11, 15 and 17 should also be in a condition for allowance.

Nevertheless, Applicant believes that the Examiner's reliance on In re Aller is inappropriate. In re Aller set forth the rule that "the discovery of an optimum value of a variable in a *known process* is normally obvious." (emphasis supplied). It should be realized that the processes claimed in claims 1 and 13 were not known processes prior to conception of the present invention. Therefore, Applicant respectfully believes that In re Aller is inapposite.


Finally, even if In re Aller were apposite, Applicant believes that the claimed depth of the heavy body trench ("second trench"), relative to the depth of the gate trench ("first trench") is not obvious when this depth is viewed in the context of the claimed process as a whole. Each of claims

9, 11, 15 and 17 depend from either of independent claims 1 and 13, each of which described above are believed novel in view of the prior art. Part of the novelty of the claimed invention is the formation of a "second trench" to implement a heavy body region. The prior art does not teach this. And, therefore, it cannot be said that the claimed depth of the gate trench relative to the heavy body trench, as claimed in claims 9, 11, 15 and 17 is obvious. For the foregoing reasons, therefore, Applicant believes that the 35 U.S.C. § 103(a) rejections of claims 9, 11, 15 and 17 cannot be maintained and, therefore, respectfully request that the rejections of these claims be withdrawn.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application are in condition for allowance and an action to that end is urged. If the Examiner believes a telephone conference would aid in the prosecution of this case in any way, please call the undersigned at 415-576-0200.

Respectfully submitted,

  
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